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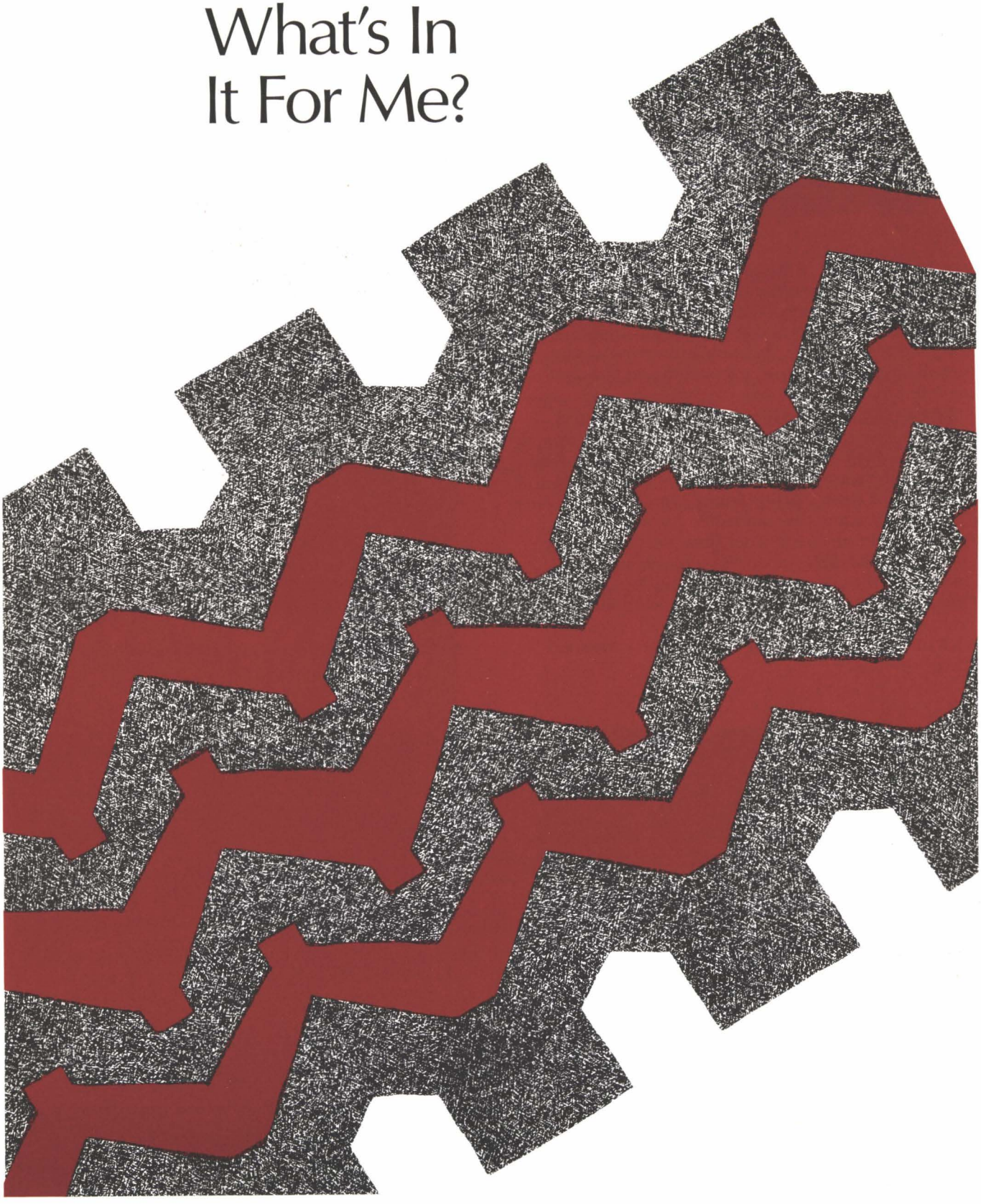
United States
Department of
Agriculture

Forest
Service

FS-415

Central Tire Inflation

What's In It For Me?



In the early years of the present century, loggers determined that the softening of tires did much to improve the operation of their logging trucks. Specifically, in the mid-1920's, an attempt was made to provide a softer tire by first thickening the cross section of the solid rubber tire in use at the time and then putting holes through the rubber to produce some "give" in the tire. In the late 1920's, pneumatic tires came into use.

Then, in 1934, Lloyd Christensen (a log trucker who worked in Oregon and Washington) and the Goodyear Tire & Rubber Co. developed the 14-ply 10.00 x 20 tire that became the standard in log trucking for many years. In succeeding decades, tires on logging trucks have had their pressures increased time after time — until these days pressures are in the 100 to 120 psi range. Once again loggers are experiencing the road damage, traction problems, and excessive truck maintenance that they did with the early solid rubber tires.

Advantages of Lower Tire Pressure on Forest Roads

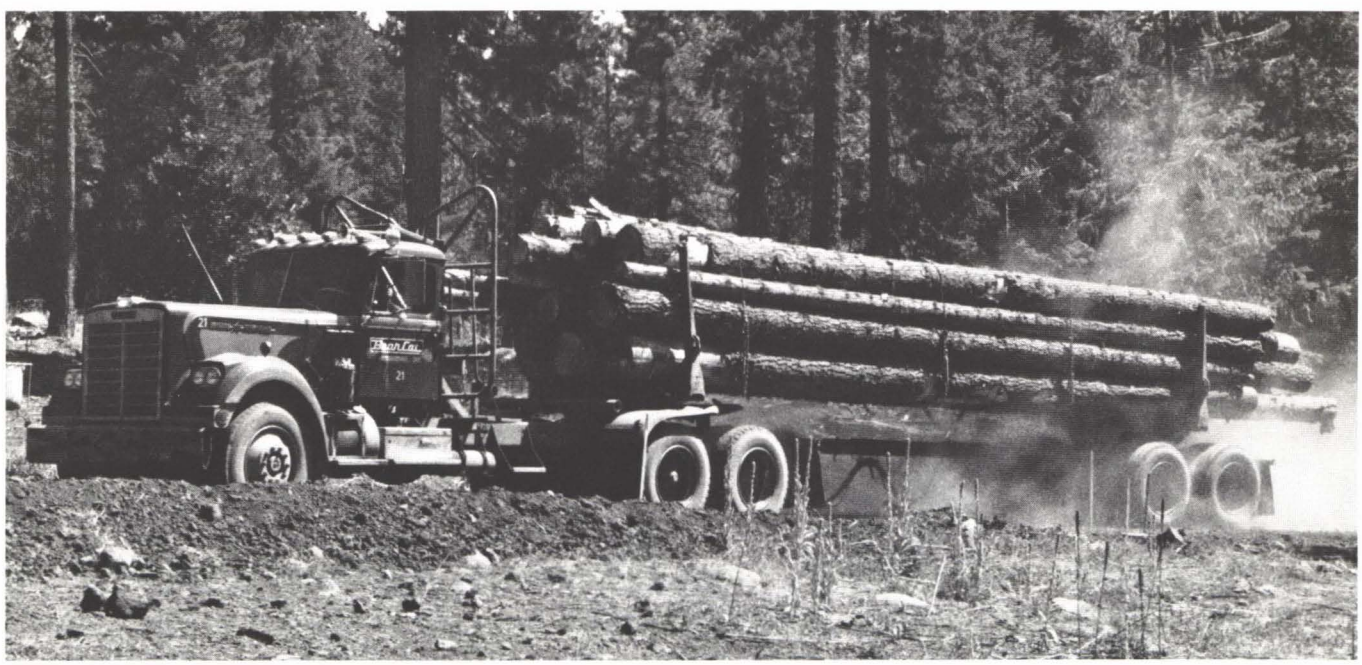
The reasons those early log truckers wanted softer tires are still valid today. Softer tires on unpaved forest roads result in the following improvements:

- Road rutting, washboarding, and other damage are reduced.
- Less aggregate surfacing is required.
- Truck wear, tear, and damage are reduced.
- Traction is improved.
- Haul seasons are extended.
- Driver fatigue and back problems are lessened.

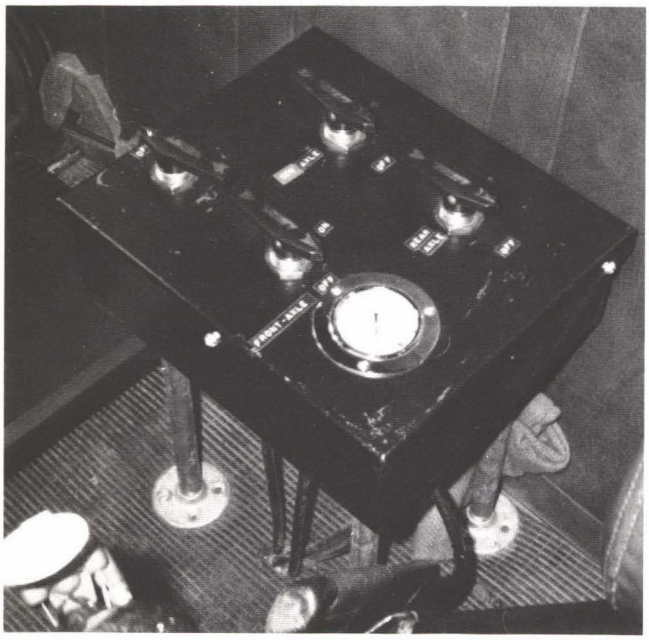
Tests with reduced pressure tires, recently completed at the Nevada Automotive Test Center by the USDA Forest Service, the U.S. military, and tire industry representatives, indicate the following **additional** improvements:

- Tire damage from cuts, bruises, and breaks is substantially reduced.
- Fuel economy is improved during poor-traction or soft-soil situations.
- Pavement damage during weak subgrade conditions is reduced.

Adequate tire pressures must be maintained for highway speeds. To attain both high tire pressure for highways and appropriate lowered tire pressure for low-speed forest roads, central tire inflation (CTI) systems are being used by the Forest Service and the U.S. Army. CTI systems allow a driver to adjust tire pressure while the truck is in motion.



Logging truck with prototype CTI system.



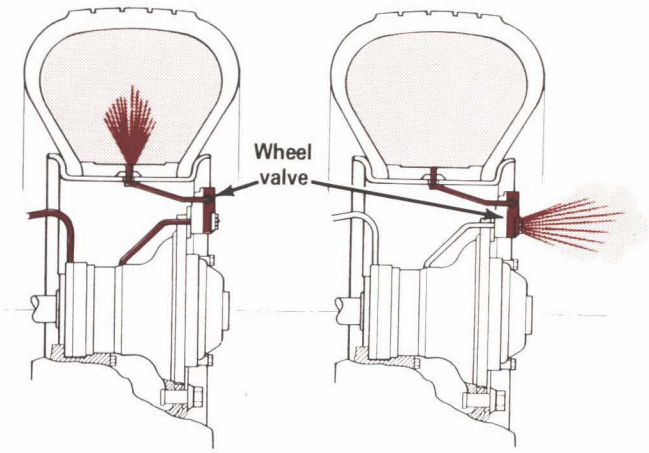
On this CTI system, tire pressure is adjusted by opening and closing air valves on this panel.

With CTI, tire pressures can be varied to realize the maximum benefit for any given load, speed, and road condition. The fuel efficiency and tire life benefits of using high pressures on high-speed highways can be realized while also gaining all the benefits of softer tires on low-speed forest roads.

How Can CTI Inflate a Rolling Tire?

Central tire inflation (CTI) systems have been available since World War II, when the U.S. Army used them. Since that time, these systems have seen very little use in the United States. However, elsewhere in the world, countries with less well developed road systems have continued to use them. Recent contracts awarded by the U.S. Army, requiring CTI on their vehicles, have renewed interest in the development of these systems in this country.

Several very ingenious methods for inflating and deflating a rolling tire have been developed. Rotating air joints and/or air seal bearings (either in the axle housing or on the axle ends) are used to transfer the air from a fixed tube to a hose rotating with the wheel.



When the tire is being inflated (left), air is routed from the truck's compressor through the rotating air seal to the tire. When it is being deflated (right), the air flows back through the wheel valve to a discharge port.

Advantages of CTI

In addition to the benefits already cited, CTI systems offer the following advantages:

- Constant monitoring of tires to detect leaks.
- Inflation of leaking tires to prevent flats.
- Warning devices to prevent high-speed/low-pressure operation.

In addition to requiring less aggregate thickness, the increased footprint length allows the tractive forces to be applied over a longer area. This increases the traction of the truck while reducing the movement of soil or aggregate on the road surface. The softening of the tires also reduces impact damage to the road surface and causes the truck to act like a pneumatic roller to smooth and shape the road rather than destroy it.

Tests conducted by the Forest Service in California, Washington, Idaho, Oklahoma, Nevada, and Alabama show dramatic improvements in road conditions brought about by the use of increased tire footprint area made possible by CTI systems.

For additional information on CTI, contact:

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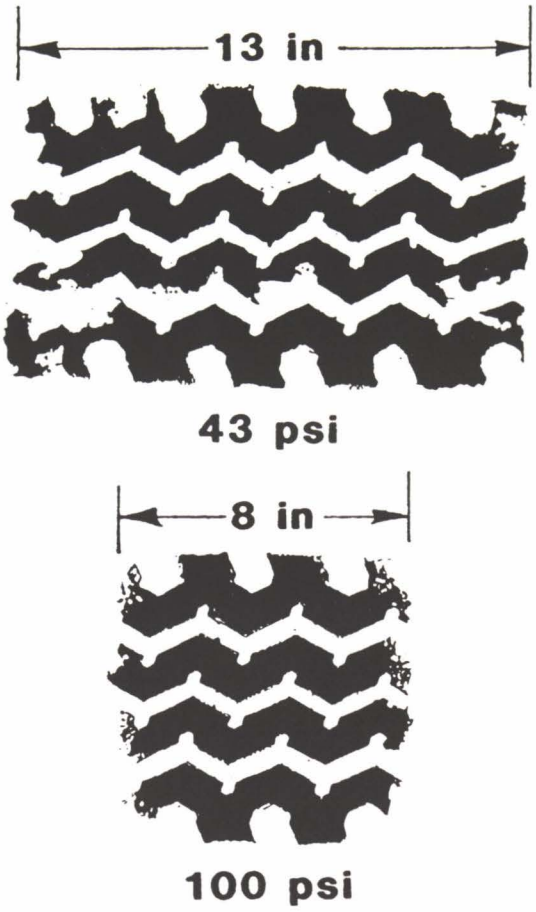
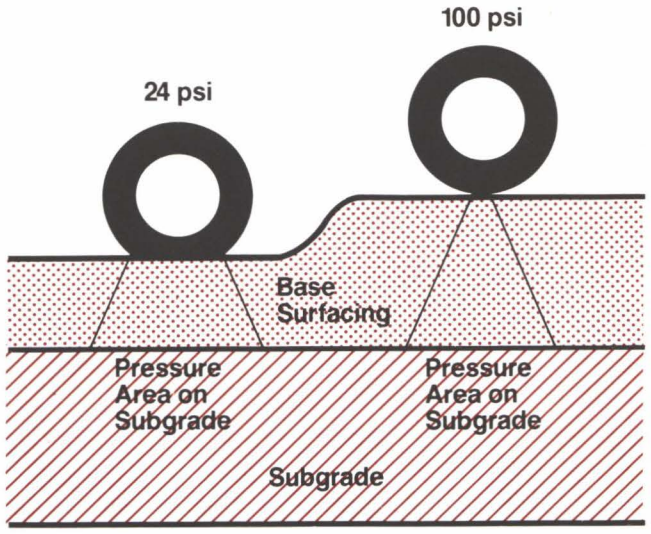


When tire pressure in a modern radial truck tire is reduced, tire contact patch is greatly increased in length (although little, if any, in width). The resulting increase in tire footprint area greatly reduces the stress applied to the road surface.



Because the tire contact area is greater, the thickness of road aggregate required to spread the load to a pressure appropriate for the subgrade material is greatly reduced.